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EMC solutions

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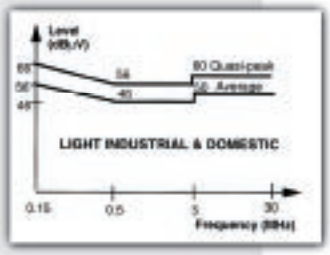
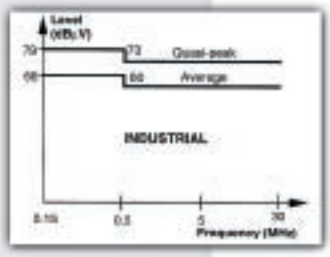
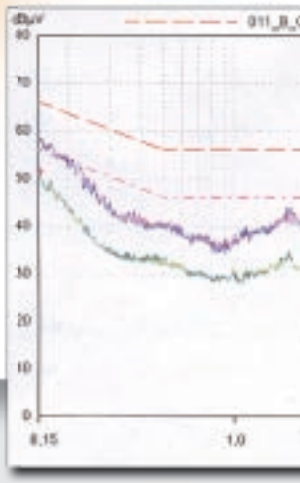
Overview

With the ever increasing use of electronics in all fields of industry EMC issues have become a major consideration.
European standards and regulations force manufacturers as well as users of machinery to comply with a set of EMC limits.
***Basic standards** define the rules and procedures which are to be employed to classify the ambient in regards to EMC.*
***Generic standards** specify the minimum requirements, which are to be obeyed when no product specific norms are applicable. This applies for levels for electromagnetic disturbance under EN61000-6-xx for domestic and office or industrial applications.*
***Product standards** apply for specific products and product groups, i.e. EN61800-3 for variable speed drives.*





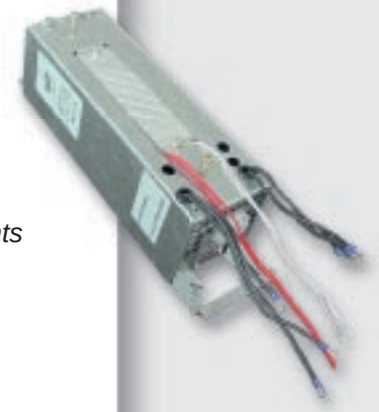
***KEB** design, manufacture and supply a comprehensive range of input / output filters and chokes. Those products can be used to make machinery compliant with the relevant EMC regulations as well as to improve operating conditions. KEB experts in the field of EMC offer advice and support during the selection process of the suitable products. For on site testing a mobile EMC service is available.*



The use of switch mode power supplies or variable speed drives with uncontroled rectifier input circuit (B2 or B6) can cause interference on the mains or the motor side. Depending on the application those interference can be reduced by the following means:

Mains

- *Input chokes can reduce the ripple and the harmonics on the mains which can improve the life time of electronic components*
- ***HF-filter** reduce the interference caused by variable speed drives. They are available in the following versions:*
  - *Standard*
  - *IT-Mains*
  - *reduced leakage*
- ***NHF-filter** combine filters and chokes in a single unit*
- ***Central filters** for 3 or 4 phase systems used for several components in one system*



For internal interference suppression

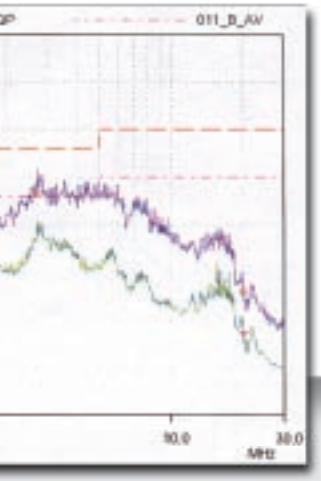
- *open chokes for **common mode current rejection** are available*

Motor:

- ***Output chokes** for 50/60 Hz; as well as 100 Hz, 300 Hz and up to 1600 Hz are available.*
- ***Sinusoidal filters** generate sinusoidal voltage characteristics and reduce the symmetric interference; available for output frequencies up to 600 Hz*
- ***Sinusoidal EMC filters** are a combination of sinusoidal and EMC filter to reduce the symmetric as well as the asymmetric interference. EMC compliance can be achieved without the need for screened cables.*

As integrated compact EMC solution

- ***I/O filters** combine input HF filter and output dv/dt filter.*



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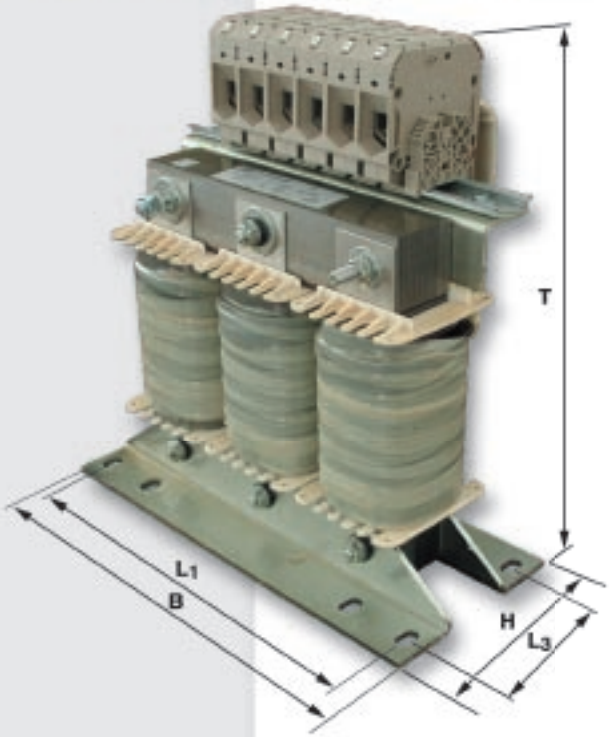


Mains Input Chokes

(for use with drives with DC-voltage-bus)

improve the ripple current which is induced into the mains by uncont
reduce the input effective current, this can increase the life time of va
DC-voltage-bus.

The chokes are designed for single or three-phase applications at 4
set for a voltage loss of 4 % at rated current and rated frequency.

Note:
Chokes emit heat as well as electromagnetic interference within a ra
other components must be mounted within this radius.

In 3 phase applications up to 65 Hz input chokes can be used as ou

Mains Input Chokes 1ph. 230 V / 45-65 Hz

Part-No.	Current I [A]	Induc-tivity L [mH]	Power loss P_V [W]	Iso-Class	Cross-section of conductor [mm²]	Dimensions B x H x T [mm]	Fixation L1 x L3 [mm]	Screw Ø	Weight m [kg]
05.DR.F08-4951	6	4.88	9	T45/B	4	60 x 60 x 80	45 x 37	3.6 x 7	0.5
07.DR.F08-2951	10	2.93	9	T45/B	4	84 x 86 x 100	64 x 48	4.8 x 9	1.4
09.DR.F08-1851	16	1.84	15	T45/B	4	84 x 86 x 100	64 x 48	4.8 x 9	1.5
10.DR.F08-1551	20	1.47	18	T45/B	4	84 x 86 x 100	64 x 48	4.8 x 9	1.5
12.DR.F08-1151	25	1.17	18	T45/B	4	96 x 100 x 115	84 x 62	5 x 11	2.6

Mains Input Chokes 3ph. 230 V / 45-65 Hz

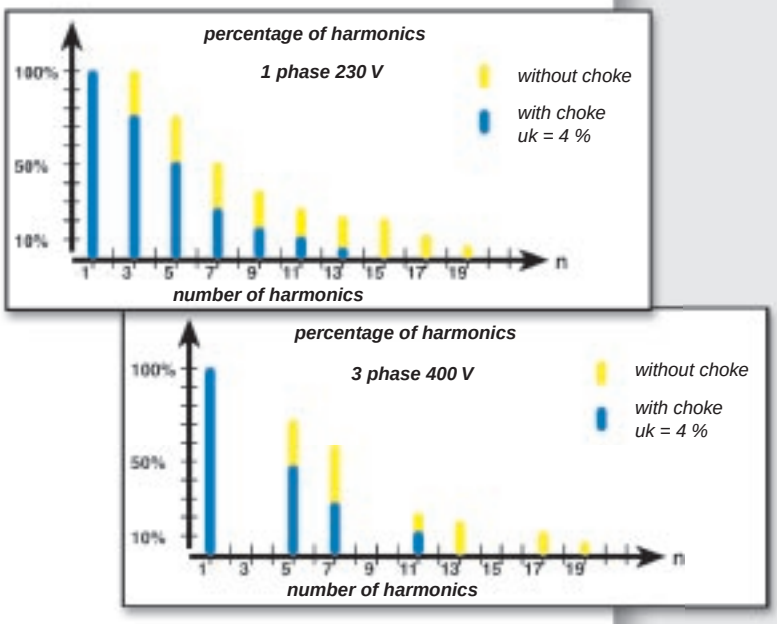
Part-No.	Current I [A]	Induc-tivity L [mH]	Power loss P_V [W]	Iso-Class	Cross-section of conductor [mm²]	Dimensions B x H x T [mm]	Fixation L1 x L3 [mm]	Screw Ø	Weight m [kg]
03.DR.A08-8451	2	8.45	3	T45/B	4	96 x 62 x 115	56 x 38	4.8 x 9	0.8
05.DR.A08-4251	4	4.22	4	T45/B	4	96 x 62 x 115	56 x 38	4.8 x 9	0.8
07.DR.A08-2851	6	2.82	21	T45/B	4	96 x 62 x 115	56 x 38	4.8 x 9	1.2
09.DR.A08-2151	8	2.12	21	T45/B	4	96 x 62 x 115	56 x 38	4.8 x 9	1.2
10.DR.A08-1551	12	1.47	30	T45/B	4	96 x 72 x 115	56 x 47	4.8 x 9	1.8
12.DR.A08-8541	20	0.85	30	T45/B	10	148 x 100 x 150	136 x 63	4.8 x 8	3.0
13.DR.A08-5641	30	0.56	45	T45/F	10	148 x 100 x 150	136 x 63	4.8 x 8	3.7
14.DR.A08-4241	40	0.42	50	T45/F	16	178 x 130 x 195	166 x 55	4.8 x 8	5.0
15.DR.A08-2841	60	0.28	63	T45/F	16	178 x 145 x 195	166 x 73	4.8 x 8	6.4
16.DR.A08-2241	70	0.22	74	T45/F	35	219 x 148 x 240	201 x 74	7 x 12	7.6
17.DR.A08-1841	85	0.18	92	T45/F	95	219 x 170 x 255	201 x 84	7 x 12	10.5
18.DR.A08-1541	100	0.15	90	T45/F	95	219 x 180 x 255	201 x 94	7 x 12	12.0
19.DR.A08-1241	130	0.12	115	T45/F	95	267 x 190 x 300	249 x 83	7 x 12	15.3
20.DR.A08-1041	160	0.11	155	T45/F	95	267 x 215 x 300	249 x 107	7 x 12	17.8

trolled input rectifiers. The chokes
ariable speed drives with

5-65 Hz. The rated inductance is

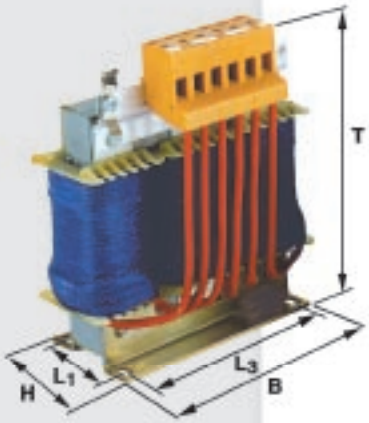
adius of 100 mm. Therefore no

tput chokes.



Mains Input Chokes 3ph. 400 V / 45-65 Hz

Part-No.	Current I [A]	Induc-tiviy L [mH]	Power loss P_V [W]	Iso-Class	Cross-section of conductor [mm^2]	Dimensions B x H x T [mm]	Fixation L1 x L3 [mm]	Screw Ø	Weight m [kg]
03.DR.B08-1461	2	14.6	19	T45/B	2.5	96 x 62 x 115	56 x 38	4.8 x 9	0.9
05.DR.B08-7351	4	7.33	22	T45/B	2.5	96 x 72 x 115	56 x 47	4.8 x 9	1.4
07.DR.B08-4951	6	4.88	22	T45/B	2.5	96 x 72 x 115	56 x 47	4.8 x 9	1.6
10.DR.B08-3751	8	3.66	33	T45/B	2.5	148 x 80 x 140	136 x 63	4.8 x 8	2.5
12.DR.B08-2851	10	2.93	33	T45/B	2.5	148 x 80 x 140	136 x 63	4.8 x 8	3
13.DR.B08-1851	16	1.83	53	T45/B	2.5	178 x 95 x 165	166 x 73	4.8 x 8	5
14.DR.B08-1451	20	1.47	54	T45/B	4.0	178 x 95 x 165	166 x 73	4.8 x 8	5.4
15.DR.B08-9841	30	0.98	76	T45/F	10	178 x 110 x 175	166 x 73	4.8 x 8	6
16.DR.B08-7341	40	0.73	76	T45/F	10	178 x 110 x 175	166 x 73	7 x 12	7
17.DR.B08-5941	50	0.59	97	T45/F	10	219 x 100 x 200	201 x 71	7 x 12	8
18.DR.B18-4941	60	0.48	100	T45/F	10	219 x 110 x 200	201 x 84	7 x 12	10
19.DR.B18-3941	75	0.39	110	T45/F	35	219 x 160 x 235	201 x 94	7 x 12	13
20.DR.B18-3341	90	0.33	151	T45/F	35	267 x 186 x 275	249 x 83	7 x 12	15
21.DR.B18-2841	115	0.25	181	T45/F	35	267 x 210 x 275	249 x 107	7 x 12	21
22.DR.B18-2241	150	0.20	205	T45/F	95	316 x 200 x 330	249 x 102	7 x 12	24
23.DR.B18-1741	180	0.16	145	T45/F	95	267 x 207 x 310	249 x 96	10 x 16	24
24.DR.B18-1541	200	0.15	168	T45/F	95	267 x 215 x 310	249 x 105	7 x 12	28
25.DR.B18-1341	230	0.13	230	T45/F	150	267 x 230 x 335	249 x 113	7 x 12	31
26.DR.B28-1141	270	0.11	290	T45/F	240	352 x 230 x 395	249 x 82	7 x 12	37
27.DR.B28-1041	300	0.10	308	T45/F	Ø11	352 x 180 x 270	328 x 95	10 x 16	48
28.DR.B28-8031	400	0.081	618	T45/F	Ø14	480 x 200 x 390	450 x 120	12 x 20	61
29.DR.B28-5331	580	0.051	680	T45/F	Ø14	480 x 210 x 390	450 x 130	12 x 20	73
30.DR.B28-4430	660	0.045	650	T45/F	Ø18	480 x 210 x 390	450 x 130	12 x 20	77



Output Chokes

- *increase the output inductance*
- *reduce ripple on output current*
- *reduce the dv/dt, which is generated by the high switching speed of the IGBT*
- *increase the life time of the insulation of the motor windings*
- *reduce the current peaks and reduce the load of the drive's IGBTs*

In three-phase applications up to 65 Hz input chokes can be used as output chokes.
Output chokes for 50/60 Hz as well as 100 Hz, 300 Hz and up to 1600 Hz are available.

Output chokes 3ph. 400 V / f_{max} = 100 Hz

Part-No.	Current I [A]	Induc-tivity L [mH]	Power-loss P_v [W]	Iso-Class	Cross-section of conductor [mm²]	Dimensions B x H x T [mm]	Fixation L1 x L3 [mm]	Screw Ø	Weight m [kg]
12.DR.C18-1251	10	1.23	33	T40/B	2.5	148 x 80 x 140	136 x 60	4.8 x 8	3.2
13.DR.C18-1051	12	1.02	38	T40/B	2.5	148 x 80 x 140	136 x 60	4.8 x 8	3.5
14.DR.C18-7741	16	0.77	55	T40/B	4.0	178 x 110 x 165	166 x 70	4.8 x 8	5.8
15.DR.C18-5141	24	0.51	70	T40/F	10	178 x 115 x 175	166 x 70	4.8 x 8	5.8
16.DR.C18-3741	33	0.37	80	T40/F	10	219 x 120 x 200	201 x 81	7 x 12	9.8
17.DR.C18-2941	42	0.29	95	T40/F	10	219 x 135 x 200	201 x 91	7 x 12	13.1
18.DR.C18-2441	50	0.245	110	T40/F	10	243 x 150 x 230	225 x 92	7 x 12	15
19.DR.C18-2041	60	0.205	135	T40/F	16	267 x 200 x 290	249 x 103	9 x 13	21.9
20.DR.C18-1641	75	0.165	160	T40/F	35	267 x 200 x 290	249 x 108	9 x 13	21.9
21.DR.C18-1341	90	0.136	185	T40/F	35	267 x 225 x 300	249 x 108	9 x 13	31.5
22.DR.C18-1141	115	0.107	185	T40/F	50	267 x 250 x 315	249 x 132	9 x 13	34
23.DR.C18-8231	150	0.082	315	T40/F	95	352 x 220 x 385	328 x 108	10 x 16	31
24.DR.C18-6831	180	0.068	300	T40/F	95	352 x 230 x 385	328 x 115	10 x 16	35
25.DR.C18-5831	210	0.058	400	T40/F	30 x 3	352 x 235 x 350	328 x 122	10 x 16	44
26.DR.C18-4931	250	0.049	485	T40/F	30 x 3	352 x 250 x 350	328 x 137	10 x 16	54
27.DR.C18-3631	330	0.036	525	T40/F	30 x 5	352 x 265 x 350	328 x 149	10 x 16	60
28.DR.C18-3131	412	0.031	600	T40/F	30 x 5	412 x 260 x 370	388 x 136	10 x 16	70

Output chokes 3ph. 400 V / f_{max} = 300 Hz

Part-No.	Current I [A]	Induc-tivity L [mH]	Power-loss P_v [W]	Iso-Class	Cross-section of conductor [mm²]	Dimensions B x H x T [mm]	Fixation L1 x L3 [mm]	Screw Ø	Weight m [kg]
00.90.290-1746	7	1.7	80	E	4	90 x 85 x 140	49 x 90	4.8	2.8
00.90.291-1046	14	1	80	E	4	90 x 85 x 140	49 x 90	4.8	2.8
00.90.292-3339	20	0.33	80	E	4	120 x 85 x 145	49 x 90	4.8	2.8
00.90.292-0446	36	0.4	200	E	10	180 x 130 x 190	76 x 136	7.0	9.7
00.90.293-2556	57	0.25	300	E	10	265 x 120 x 270	75 x 200	11.0	17.8
00.90.294-1556	90	0.15	450	E	ø 8	300 x 190 x 280	118 x 224	11.0	35.7

Common mode chokes for EMC demands

are used in series between the source of the interference and the mains connection. They reduce asymmetrical interference measured against PE. The specific design of these chokes leads to the effect that all currents induced by the system load current eliminate each other. The full inductivity of the choke thus acts for the interference current that flows from the phases respectively the connected neutral conductor to the protective conductor. The common mode chokes are designed for the setup of interference suppressor filters in power electronic applications. The type series of chokes differ in design ***two-wire choke DR.100*** *(phase +N, and/or +/- intermediate circuit),*
three-wire choke DR.300 *(three-phase mains) and*
four-wire choke DR.400 *(three-phase+N).*
Mechanically the chokes are constructed in open design for print assembly.

Two-wire choke, 300 V AC

Part-No.	Current I [A]	Inductivity L [mH]	Internal resistance R [mΩ]	max. Ø [mm]	max. height h [mm]
07.DR.100-3050	6.8	3.0	12.9	46	26
07.DR.100-9450	8	9.4	28.52	63	25
09.DR.100-1750	16	1.7	5.35	63	25
10.DR.100-1350	22	1.3	3.77	63	25
12.DR.100-2250	36	2.2	7.85	73	40

Three-wire choke, 500 V AC

Part-No.	Current I [A]	Inductivity L [mH]	Internal resistance R [mΩ]	max. Ø [mm]	max. height h [mm]
09.DR.300-5250	8	5.2	21.1	63	25
10.DR.300-8650	8	8.6	20.0	75	38
13.DR.300-3350	16	3.3	6.23	70	29
13.DR.300-8650	16	8.6	8.9	75	38
14.DR.300-2150	22	2.1	5.0	70	30
14.DR.300-6050	22	6	6.6	72	37
15.DR.300-1350	30	1.35	3.22	66	35
15.DR.300-3150	30	3.1	4.3	75	45
16.DR.300-1650	50	1.6	2.21	99	48
18.DR.300-8840	65	0.88	1.2	115	60
19.DR.300-7040	75	0.7	0.7	115	60
22.DR.300-7040	130	0.7	0.57	140	70

Four-wire choke, 500 V AC

Part-No.	Current I [A]	Inductivity L [mH]	Internal resistance R [mΩ]	max. Ø [mm]	max. height h [mm]
10.DR.400-3050	8	3	9.15	65	35
14.DR.400-2150	22	2.1	5.67	75	40
15.DR.400-1350	30	1.3	2.74	85	55
17.DR.400-1350	50	1.3	1.93	110	60
18.DR.400-1050	65	1	1.1	125	70
21.DR.400-9440	100	0.94	0.72	150	100

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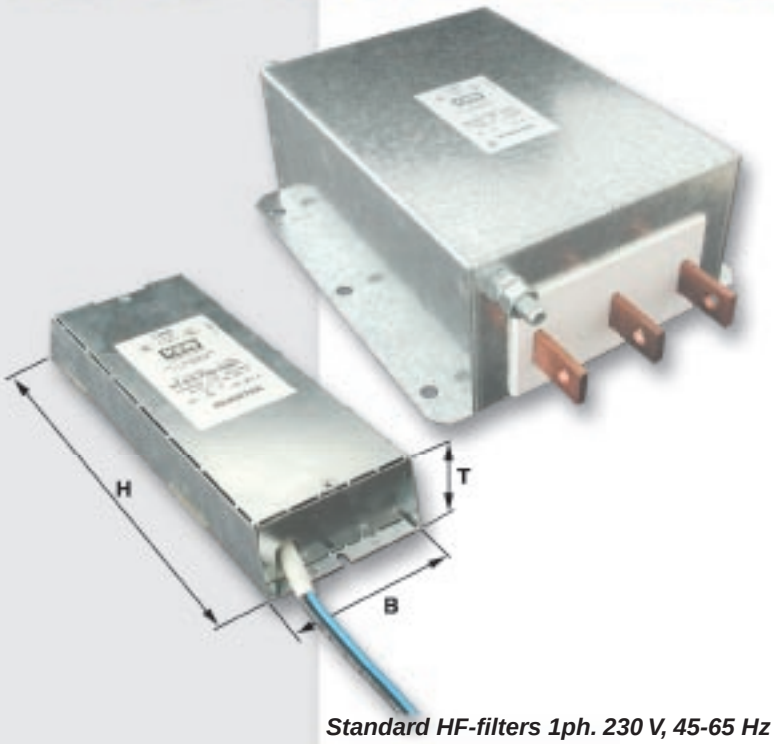


Standard HF-filters

are input filters used to reduce line conducted high frequer
These filters comprise of an LC-circuit which gives a maxir
mains.
These filters are designed to reduce the input noise of vari
high damping. The chosen inductive components are highl
used with any lengths of cable at any switching frequency.
immunity against noise from the mains.
These filters offer an ideal combination of high damping, lo

Standard HF-filters are available in footprint design from 0.
design from 90 kW.

Standard HF-filters 1ph. 230 V, 45-65 Hz

Part-No.	Current I [A]	Power loss P_V [W]	Leakage current I_{ab} [mA]	EMC-level/ cable length	Cross-section of conductor [mm²]	Substructure housing	Dimensions B x H x T [mm]	Weight m [kg]
07.E5.T60-0061	8	5	3.4	B/10m	4	B	90 x 250 x 40	0.9
10.E5.T60-0001	22	20	12	B/30m	4	B	90 x 250 x 40	0.9
10.E5.T60-0002	22	20	12	B/30m	4	D	90 x 285 x 40	0.9
12.E5.T60-0001	36	20	17	B/30m	10	E	130 x 352 x 50	1.5

Standard HF-filters 3ph. 460 V, 45-65 Hz

Part-No.	Current I [A]	Power loss P_V [W]	Leakage current I_{ab} [mA]	EMC-level/ cable length	Cross-section of conductor [mm²]	Substructure housing	Dimensions B x H x T [mm]	Weight m [kg]
10.E5.T60-1001	8	7	15	B/30m	4	B	90 x 250 x 40	1.3
10.E5.T60-1002	8	7	15	B/30m	4	D	90 x 285 x 40	1.3
12.E5.T60-1001	16	11.5	20	B/30m	4	B	90 x 250 x 40	1.3
13.E5.T60-1001	16	11.5	20	B/30m	4	D	90 x 285 x 40	1.3
14.E5.T60-1001	22	16	20	B/30m	4	D	90 x 285 x 50	1.5
14.E4.T60-1001	22	14	17	B/30m	6	E	130 x 352 x 50	1.5
15.E4.T60-1001	30	21	17	B/30m	10	E	130 x 352 x 50	1.5
16.E5.T60-1001	50	14	17	B/30m	10	E	130 x 352 x 50	1.8
16.E4.T60-1001	50	14	17	B/30m	10	G	181 x 415 x 56	3.2
18.E4.T60-1001	65	15	30	B/30m	25	H	300 x 445 x 66	5.1
19.E4.T60-1001	75	20	30	B/30m	25	H	300 x 445 x 66	6
20.E4.T60-1001	110	60	48	B/30m	50	R	270 x 420 x 64	8.5
22.E4.T60-1001	130	60	48	B/30m	50	R	270 x 420 x 64	9
23.E4.T60-1001	180	40	45	B/30m	50	-	110 x 474 x 240	13
25.E4.T60-1001	250	50	55	B/30m	70	-	110 x 630 x 240	16
27.E4.T60-1001	330	75	60	B/30m	95	-	110 x 630 x 240	18
26.E4.T60-1001	280	50	60	A/30m	Ø	-	385 x 115 x 260	14
28.E4.T60-1001	410	50	60	A/30m	Ø	-	385 x 115 x 260	14
30.E4.T60-1001	800	60	60	A/30m	Ø	-	300 x 135 x 210	14

nt disturbance.
mum adaptation of interference source and the

iable speed drives over a wide frequency range and
y saturation-proof which allows these filters to be
Another benefit is the improvement of the drive's

ow leakage current and a compact housing.

37 kW up to 75 kW and in a compact side-mount

Low leakage filters / LL-HF-filters

Complement the HF-filter range for applications that only allow a low leakage current at short cable lenghts.

LL-HF-filters 1ph. 230 V, 45-65 Hz

Part-No.	current I [A]	Power loss P_V [W]	Leakage current I_{ab} [mA]	EMC-level/ cable length	Cross-section of conductor [mm²]	Substructure housing größe	dimensions B x H x T [mm]	weight m [kg]
07.E5.T60-0061	8	5	3.4	B/10m	4	B	90 x 250 x 40	0.9
10.E5.T60-0061	22	20	4.5	B/10m	4	B	90 x 250 x 40	0.9
10.E5.T60-0062	22	20	4.5	B/10m	4	D	90 x 285 x 40	0.9

LL-HF-filters 3ph. 460 V, 45-65 Hz

Part-No.	current I [A]	Power loss P_V [W]	Leakage current I_{ab} [mA]	EMC-level/ cable length	Cross-section of conductor [mm²]	Substructure housing größe	dimensions B x H x T [mm]	weight m [kg]
10.E5.T60-1061	8	7	4.5	B/10m	4	B	90 x 250 x 40	1.3
10.E5.T60-1062	8	7	4.5	B/10m	4	D	90 x 285 x 40	1.3
12.E5.T60-1061	16	11.5	4.5	B/10m	4	B	90 x 250 x 40	1.3
13.E5.T60-1061	16	11.5	4.5	B/10m	4	D	90 x 285 x 40	1.3
14.E5.T60-1061	22	14	4.5	B/10m	4	D	90 x 285 x 50	1.5
14.E4.T60-1061	22	14	4.5	B/10m	6	E	130 x 325 x 50	1.5
15.E4.T60-1061	30	21	4.5	B/10m	10	E	130 x 325 x 50	1.5
16.E4.T60-1061	50	14	11	B/10m	10	G	181 x 415 x 56	3.2
18.E4.T60-1061	65	15	11	B/10m	25	H	300 x 445 x 66	5.1
19.E4.T60-1061	75	20	11	B/10m	25	H	300 x 445 x 66	6

COMBILINE

IT-HF-filters

In stand alone mains the insulation resistance to ground is continuously monitored. Discharge resistor are ignored during this monitoring process as they would corrupt the result.
The compact IT-filters are in regards to damping and housing design equivalent to the Hf-filter range.

IT-HF-filter 3ph. 460 V, 45-65 Hz

Part-No.	*Current I [A]*	*Power loss P_V [W]*	*Leakage current I_{ab} [mA]*	*EMC-level/ cable length*	*Cross-section of conductor [mm²]*	*Substructure housing*	*Dimensions B x H x T [mm]*	*Weight m [kg]*
10.E5.T60-1051	8	7	15	B / 30m	4	B	90 x 250 x 40	1.3
10.E5.T60-1052	8	7	15	B / 30m	4	D	90 x 285 x 40	1.3
12.E5.T60-1051	16	11.5	20	B / 30m	4	B	90 x 250 x 40	1.3
13.E5.T60-1051	16	11.5	20	B / 30m	4	D	90 x 285 x 40	1.3
14.E5.T60-1051	22	16	20	B / 30m	4	D	90 x 285 x 50	1.5
14.E4.T60-1051	22	14	17	B / 30m	6	E	130 x 352 x 50	1.5
15.E4.T60-1051	30	21	17	B / 30m	10	E	130 x 352 x 50	1.5
16.E5.T60-1051	50	14	17	B / 30m	10	E	130 x 352 x 50	1.8
16.E4.T60-1051	50	14	17	B / 30m	10	G	181 x 415 x 56	3.2
18.E4.T60-1051	65	15	30	B / 30m	25	H	300 x 445 x 66	5.1
19.E4.T60-1051	75	20	30	B / 30m	25	H	300 x 445 x 66	6
20.E4.T60-1051	110	60	48	B / 30m	50	R	270 x 420 x 64	8.5
22.E4.T60-1051	130	60	48	B / 30m	50	R	270 x 420 x 64	9
23.E4.T60-1051	180	40	45	B / 30m	50	-	474 x 100 x 240	13
25.E4.T60-1051	250	50	55	B / 30m	70	-	630 x 110 x 240	16
27.E4.T60-1051	330	75	60	B / 30m	95	-	630 x 110 x 240	18
26.E4.T60-1051	280	50	60	A / 30m	Ø	-	385 x 115 x 260	14
28.E4.T60-1051	410	50	60	A / 30m	Ø	-	385 x 115 x 260	14
30.E4.T60-1051	800	60	60	A / 30m	Ø	-	300 x 135 x 210	14

NHF-filters

combine input choke and HF-filter in a single unit. This unit offers the benefits of HF-filter and input choke in one compact housing, resulting in a unit that offers a high degree of saturation together with a low leakage current. These filters are available in the compact side-mount design only.

Part-No.	Current I [A]	Power loss P_V [W]	Leakage current I_{ab} [mA]	EMC-level/ cable length	Cross-section of conductor [mm²]	Dimensions B x H x T [mm]	Weight m [kg]
13.E5.T60-1011	13.5	1.83	25	B / 30m	4	80 x 290 x 200	5.5
14.E5.T60-1011	18.5	1.47	25	B / 30m	6	100 x 340 x 230	9
15.E5.T60-1011	26.5	0.98	25	B / 30m	6	100 x 340 x 230	9.8
16.E5.T60-1011	37	0.73	30	B / 30m	10	100 x 340 x 230	10.5
17.E5.T60-1011	47	0.59	30	B / 30m	25	110 x 340 x 230	13
18.E5.T60-1011	55	0.48	35	B / 30m	25	110 x 340 x 230	16
19.E5.T60-1011	66	0.39	35	B / 30m	25	110 x 340 x 230	17

Housing system COMBILINE

The housings of the HF-filter range was designed with the KEB COMBIVERT F5 variable speed drives in mind and with the aim to reduce the necessary cabinet space to a minimum.

Standard HF-filters are available in footprint design from 0.37 kW up to 75 kW, together with screening kits and bespoke solutions. Screening kits are tailored to the use with the KEB COMBIVERT F5 drives range.

Above 75 kW filters are available in a compact side-mount design which offers optimum earth connectivity.

Footprint version

*A mechanical and electrical effective ground connection of screened cables is achieved by using the **KEB EMC-Adapters**, which are available for power and control terminals.*

Housing	Part-Nr.	
	Power circuit	Control circuit
B	B0.F5.T88-0001	integrated
D	B0.F5.T88-0001	integrated
E	E0.F5.T88-0001	integrated
G	G0.F5.T88-0001/2	G0.F5.T88-0005
H	H0.F5.T88-0001/2	H0.F5.T88-0005

For inverters with a rated power of 90 kW and above KEB offers a

book-style side-mount filter

range, that is tailored to the specific requirements of higher powers. For optimum results the filters connect via short screened flying leads to the inverter and are to be mounted on a conductive backplate.

COMBILINE

Mains central HF-filter

are a very cost-effective option for the filtering of entire systems or cabinets. The filters should be mounted as closely as possible to the mains entrance.

When using this filter it is crucial to ensure that individual devices cannot interfere with each other.
Mains central HF-Filter can be supplied in two different versions:
***Three wire filter** -> for connection of three-phase drives (without Neutral)*
***Four wire filter**-> for connection of single and three phase drives*

All filters of this range can be mounted in footprint or book-style.

Three wire filter 460 V, 45-65 Hz class -A-

Part-No.	*Current I [A]*	*Power loss P_V [W]*	*Leakage current I_{ab} [mA]*	*EMC level EN 55011*	*Cross-section of conductor [mm²]*	*Dimensions B x H x T [mm]*	*Weight m [kg]*
10.E4.T60-3A01	8	7	30	A	4	45 x 225 x 80	0.9
13.E4.T60-3A01	16	11.5	30	A	6	45 x 225 x 80	1
15.E4.T60-3A01	30	18	30	A	10	50 x 270 x 90	1.8
17.E4.T60-3A01	50	20	30	A	10	70 x 330 x 180	3.2
19.E4.T60-3A01	80	25	35	A	25	80 x 398 x 200	6
22.E4.T60-3A01	130	30	35	A	25	80 x 406 x 200	6

Three wire filter 460 V, 45-65 Hz class -B-

Part-No.	Current I [A]	Power loss P_V [W]	Leakage current I_{ab} [mA]	EMC level EN 55011	Cross-section of conductor [mm²]	Dimensions B x H x T [mm]	Weight m [kg]
10.E4.T60-3001	12	11	30	B	4	60 x 275 x 150	2.5
14.E4.T60-3001	20	25	30	B	6	70 x 310 x 180	3.5
15.E4.T60-3001	30	25	30	B	10	70 x 310 x 180	4
17.E4.T60-3001	50	45	30	B	10	80 x 370 x 200	5.5
18.E4.T60-3001	70	55	35	B	25	90 x 458 x 240	8
21.E4.T60-3001	110	90	35	B	25	120 x 458 x 240	11

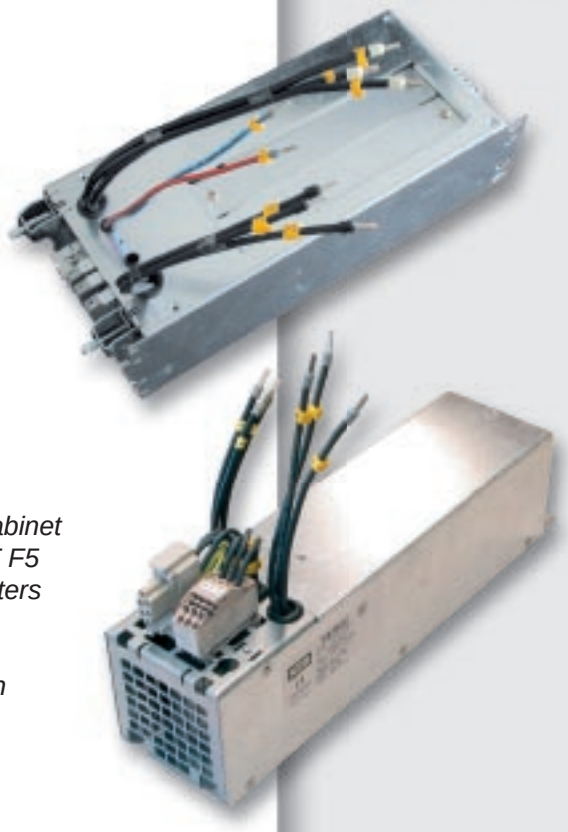
Four wire filter 460 V, 45-65 Hz class -B-

Part-No.	Current I [A]	Power loss P_V [W]	Leakage current I_{ab} [mA]	EMC level EN 55011	Cross-section of conductor [mm²]	Dimensions B x H x T [mm]	Weight m [kg]
10.E4.T60-4001	12	11	30	B	4	60 x 275 x 150	2.5
14.E4.T60-4001	20	25	30	B	6	70 x 310 x 180	3.5
15.E4.T60-4001	30	25	30	B	10	70 x 310 x 180	4
17.E4.T60-4001	50	45	30	B	10	80 x 370 x 200	5.5
18.E4.T60-4001	70	55	35	B	25	90 x 458 x 240	8
21.E4.T60-4001	110	90	35	B	25	120 x 458 x 240	11

I/O-filters

combine in one compact housing the functionality of input HF-filters and output dv/dt-filters. The input part of filter offers a high damping with low leakage current and minimizes the line-conducted interference to a class B compliant level. The output part is available in two designs:

- ***Output frequencies up to 100/200/400 Hz***
  output filter with choke to reduce the dv/dt and peaks
- ***Output frequencies up to 800/1200 Hz***
  output filter with choke to reduce the dv/dt and peaks together with DC-bus-voltage feedback for limitation of phase to ground voltage



The compact design with flying leads requires only a minimum amount cabinet space. When used with variable speed drives from the KEB COMBIVERT F5 series the filters can be sub- or side-mounted. In the same housing the filters can be supplied with a braking resistor if required.
I/O filters are designed for use with cable lengths up to 100 m and give sufficient protection against voltage gradients and voltage peaks. This can improve the lifetime of the motor windings significantly.
It is especially useful in retrofit applications or in any application where used motors are modernized for a variable speed system

I/O filters 3ph. 460 V - motor frequency up to 100/200/400 Hz

Part-No.	Rated Motor power P [kW]	Leakage current I_{ab} [mA]	EMC level Cable length	Cross-section of conductor [mm²]	Substructure housing	max. Motor-frequency	Switching frequency kHz	Dimensions B x H x T [mm]	Weight m [kg]
10.E5.T60-10G1	2.2	10	B/100 m	4	B/D	300 Hz	4	90 x 360 x 90	4.2
13.E5.T60-10G1	5.5	10	B/100 m	4	B/D	300 Hz	4	90 x 360 x 90	4.2
14.E5.T60-10G1	7.5	10	B/100 m	4	D	300 Hz	4	90 x 360 x 90	5.1
15.E5.T60-10G1	11	13	B/100 m	10	E	300 Hz	4	130 x 360 x 85	6.4
16.E5.T60-10G1	15	13	B/100 m	10	E	300 Hz	4	130 x 360 x 85	6.5
16.E5.T60-10G1	15	13	B/100 m	16	G	300 Hz	4	170 x 412 x 100	6.9
18.E5.T60-10G1	22	20	B/100 m	16	G	100 Hz	2	170 x 412 x 100	8.5

I/O filters 3ph. 460 V - motor frequency up to 800/1200 Hz

Part-No.	Rated Motor power P [kW]	Leakage current I_{ab} [mA]	EMC level Cable length	Cross-section of conductor [mm²]	Substructure housing	max. Motor-frequency	Switching frequency kHz	Dimensions B x H x T [mm]	Weight m [kg]
10.E5.T60-1071	2.2	12	B/50 m	4	B/D	1600 Hz	16	90 x 280 x 100	2.5
13.E5.T60-1071	5.5	12	B/50 m	4	B/D	1600 Hz	16	90 x 280 x 100	3.2
15.E5.T60-1071	11	20	B/50 m	10	E	1600 Hz	16	130 x 360 x 85	5.8
16.E5.T60-1071	15	20	B/50 m	10	G	1600 Hz	16	170 x 412 x 100	8.0
19.E5.T60-1071	30	25	B/50 m	25	H	1600 Hz	16	297 x 412 x 110	15

Sinusoidal-filters

Give an output voltage with sinusoidal characteristic with ripple of less than 10 %, they are designed for low voltage drop and low capacitive currents.

Sinusoidal filters minimise symmetrical interference; as a result the effect of eddy-current losses, motor noise and stress on the motor isolation are reduced, which allows the use of output cables longer than 100 m.

Please note:
Sinusoidal filters must only be operated with the specified switching frequencies and output frequencies.

Available versions:
- ***Sinusoidal filter .AF.300.*** *up to 70 Hz output frequency / open design*
- ***Sinusoidal filter .AF.400.*** *up to 200 Hz output frequency / open design*
- ***Sinusoidal filter .AF.506.*** *up to 600 Hz output frequency / enclosed design*

Sinusoidal filters 3ph. 460 V, f_{max} = 70 Hz

Part-No.	Current I [A]	Power loss P_v [W]	max. Motor frequency [Hz]	Switching frequency [kHz]	Cross-section of conductor [mm²]	Dimensions B x H x T [mm]	Weight m [kg]
07.AF.300-3520	3.5	40	100	4-12	2.5	125 x 110 x 180	2.6
09.AF.300-3520	4.5	45	70	4-12	2.5	125 x 110 x 180	3
10.AF.300-3520	8	65	70	4-12	4	155 x 118 x 205	6.6
12.AF.300-3520	10	70	70	4-12	4	155 x 118 x 205	7
13.AF.300-3520	12	90	70	4-12	4	190 x 125 x 230	7.3
14.AF.300-3520	18	115	70	4-12	10	190 x 125 x 230	11.5
15.AF.300-3520	24	130	70	4-12	10	210 x 135 x 260	14
16.AF.300-3520	32	140	70	4-12	10	210 x 135 x 260	16
17.AF.300-3520	42	150	70	4-12	10	230 x 190 x 280	27
18.AF.300-3520	50	230	70	4-12	16	240 x 210 x 290	28
19.AF.300-3520	60	250	70	4-12	25	240 x 220 x 290	35
20.AF.300-3520	75	290	70	4-12	35	300 x 210 x 345	42
21.AF.300-3520	90	360	70	4-12	35	310 x 215 x 345	46
22.AF.300-3520	110	430	70	4-12	70	300 x 237 x 345	58
23.AF.300-3510	150	750	70	2-8	95	420 x 217 x 470	75
23.AF.300-3520	150	750	70	4-12	95	420 x 217 x 470	75
24.AF.300-3510	180	870	100	2-8	30 x 3	420 x 235 x 470	88
24.AF.300-3520	180	870	100	4-12	30 x 3	420 x 235 x 470	88
25.AF.300-3510	210	1140	70	2-8	30 x 3	420 x 260 x 470	115
25.AF.300-3520	210	1140	70	4-12	30 x 3	420 x 260 x 470	115
26.AF.300-3520	270	1320	70	4-12	30 x 3	420 x 295 x 470	150
27.AF.300-3510	325	1900	100	2-8	30 x 3	480 x 310 x 560	194
27.AF.300-3520	325	1900	100	4-12	30 x 3	480 x 310 x 560	194
28.AF.300-3510	410	1930	100	2-8	30 x 3	480 x 310 x 560	206
28.AF.300-3520	410	1930	100	4-12	30 x 3	480 x 310 x 580	206

Sinusoidal filters 3ph. 460 V, f_{max} = 200 Hz

Part-No.	*Current I [A]*	*Power loss P_v [W]*	*max. Motor-frequency [Hz]*	*Switching frequency [kHz]*	*Cross-section of conductor [mm²]*	*Dimensions B x H x T [mm]*	*Weight m [kg]*
13.AF.400-3520	12	120	200	4-12	4	190 x 140 x 240	12.4
14.AF.400-3520	18	145	200	4-12	4	210 x 145 x 260	17
15.AF.400-3520	24	230	200	4-12	10	240 x 210 x 390	22.3
16.AF.400-3520	33	415	200	4-12	10	300 x 220 x 350	32
17.AF.400-3520	42	480	200	4-12	16	300 x 220 x 350	36
18.AF.400-3520	50	560	200	4-12	16	300 x 210 x 440	41
19.AF.400-3520	60	580	200	4-12	35	300 x 210 x 440	46
20.AF.400-3520	75	680	200	4-12	35	300 x 230 x 440	57
21.AF.400-3520	90	800	200	4-12	50	360 x 240 x 480	70
22.AF.400-3520	115	800	200	4-12	30 x 3	420 x 270 x 530	77
23.AF.400-3520	150	900	200	4-12	30 x 3	480 x 300 x 530	93
24.AF.400-3520	180	1000	200	4-12	30 x 3	480 x 300 x 530	93

Sinusoidal filters 3ph. 460 V, f_{max} = 600 Hz

Part-No.	Current I [A]	Power loss P_v [W]	max. Motor-frequency [Hz]	Switching frequency [kHz]	Cross-section of conductor [mm²]	Dimensions B x H x T [mm]	Weight m [kg]
10.AF.506-3585	8		600	≥12	6	70 x 310 x 160	4.5
13.AF.506-3585	12		600	≥12	6	70 x 310 x 160	5
14.AF.506-3585	18		600	≥12	6	80 x 310 x 200	6.5
15.AF.506-3585	24		600	≥12	10	80 x 310 x 200	7
16.AF.506-3585	32		600	≥12	10	80 x 310 x 200	7.5
17.AF.506-3585	42		600	≥12	25	90 x 458 x 240	13.5
19.AF.506-3585	60		600	≥12	25	160 x 445 x 230	12

Sinusoidal-Output-EMC-Filters

in combination with KEB COMBILINE Sinusoidal filter reduce symmetric as well as asymmetric interference.
Benefits of this set up are:
- Current EMC standard is met even without the use of screened cables
- Maximum motor cable lengths is limited by the voltage drop by the cable
- Lower specification input filter can be used.
The design of the Sinusoidal-Output-EMC-Filters is based on modules in individual housings. The filters are sized for wide current ranges and can be used in combination with any sinusoidal filter.

For technical details please contact our EMC application experts. They will be happy to discuss your application and work with you to find the - technically and commercially - most suitable solution.

people in motion

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